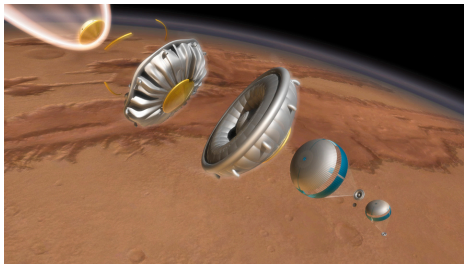
Space Technology: Investments in our Future

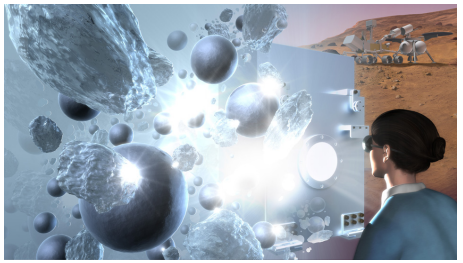
FY12 Overview
April 2011

www.nasa.gov

Space Technology: Investments in Our Future

- **Through NASA, America Continues to Dream Big:** NASA's future aeronautics, science and exploration missions are grand in scope and bold in stature.
- **Enabling Our Future in Space:** By investing in high payoff, disruptive technology that industry cannot tackle today, *Space Technology* matures the technology required for NASA's future missions in science and exploration while proving the capabilities and lowering the cost of other government agencies and commercial space activities.
- **NASA at the Cutting Edge:** Pushing the boundaries of aeroscience and taking informed-risk, *Space Technology* allows NASA and our Nation to remain at the cutting-edge.
- **Technological leadership is the "Space Race" of the 21st Century:** NASA's *Space Technology* investments will stimulate the economy and build our Nation's global economic competitiveness through the creation of new products and services, new business and industries, and high-quality, sustainable jobs.
- **NASA makes a difference in our lives everyday**: Knowledge provided by weather and navigational spacecraft, efficiency improvements in both ground and air transportation, super computers, solar- and wind-generated energy, the cameras found in many of today's cell phones, improved biomedical applications including advanced medical imaging and even more nutritious infant formula, as well as the protective gear that keeps our military, firefighters and police safe, have all benefitted from our nation's investments in aerospace technology. By investing in *Space Technology*, NASA will continue to make a difference in the world around us.

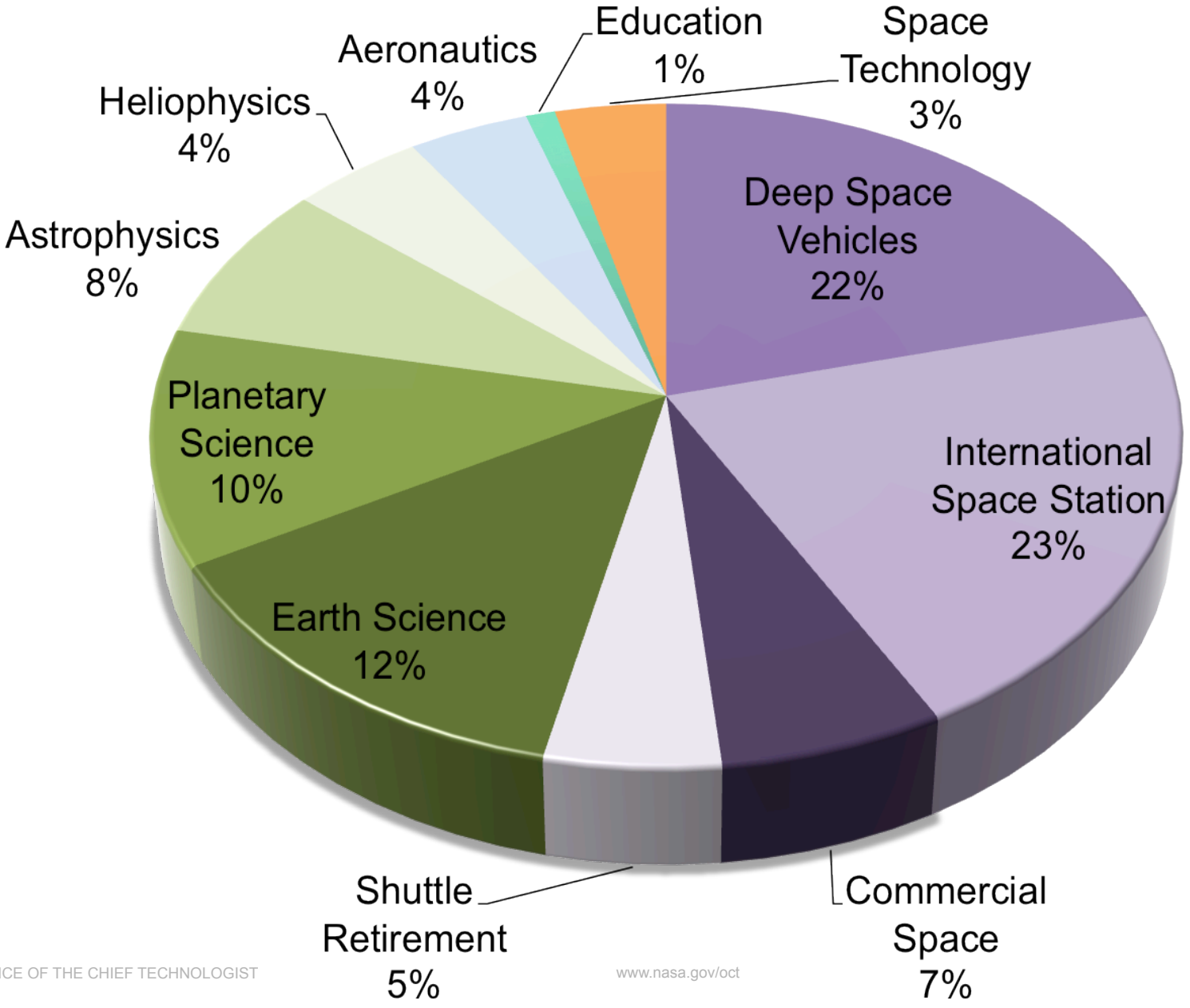




Space Technology

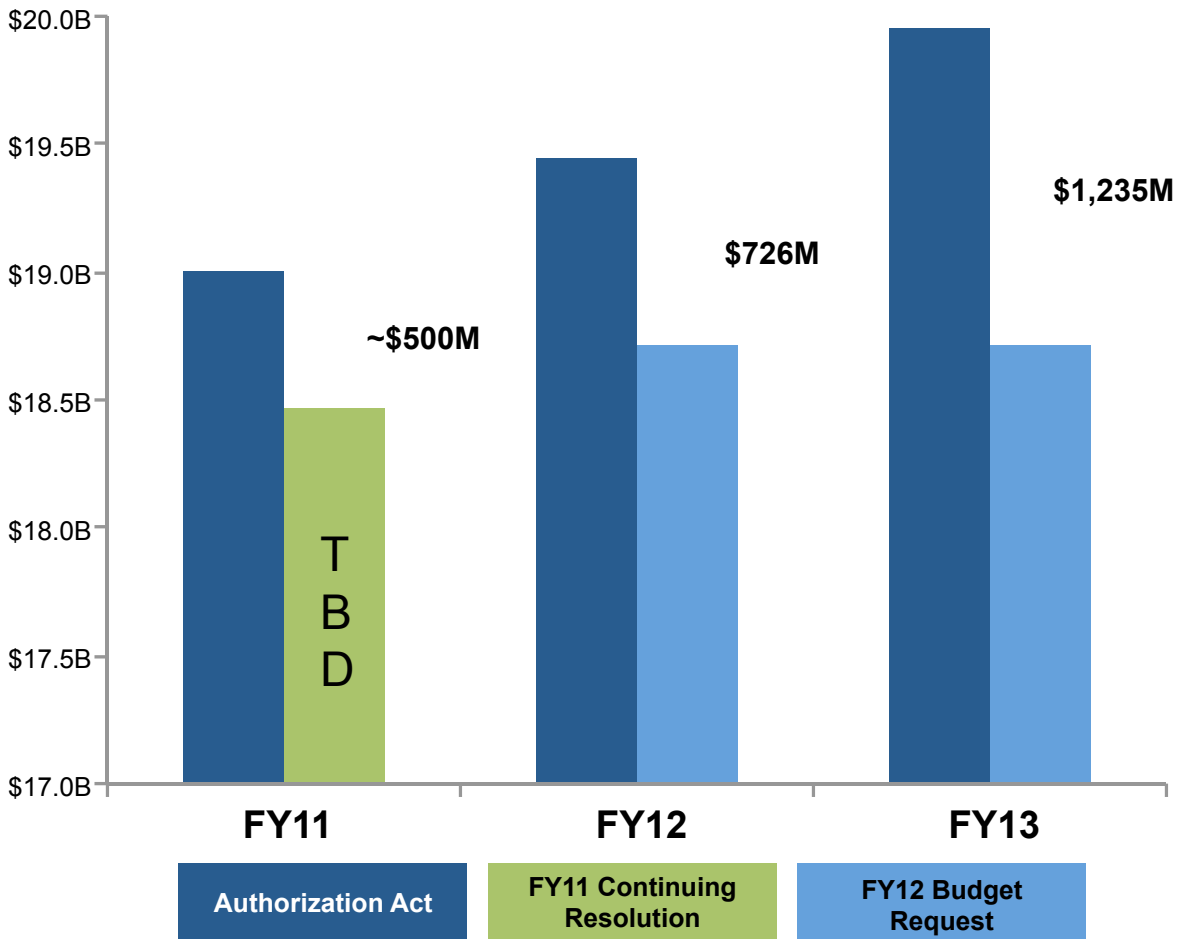
- **Space Technology is a budget line in the FY 2012 request for NASA**
  - Technology development and innovation projects that are broadly applicable to the Agency's future missions in science and exploration while providing space technologies that can improve the capabilities and lower the cost of other government agency and commercial space activities
  - Includes Partnerships, Innovation and Emerging Space (PI&ES), Strategic Integration (SI), Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR), Crosscutting Space Technology and Exploration Technology
  - The President's FY 2012 NASA Space Technology budget request is $1,024 million, a modest increase from the amounts authorized for this suite of programs for FY 2012 in the NASA Authorization Act of 2010, consistent with the Administration's priority on investments in research, technology, and innovation
  - **Managed by Office of the Chief Technologist (OCT)**
- **Space Technology builds on the success of NASA's Innovative Partnerships Program (IPP)**
  - In FY 2011, IPP was integrated into Office of the Chief Technologist and the IPP budget integrated into Space Technology
  - In FY 2012, Exploration Technology activities and budget are integrated into Space Technology
- **Formulation of the Space Technology program is complete**
  - Formally approved by Administrator at July 29 Acquisition Strategy Planning meeting

NASA Programmatic Budget

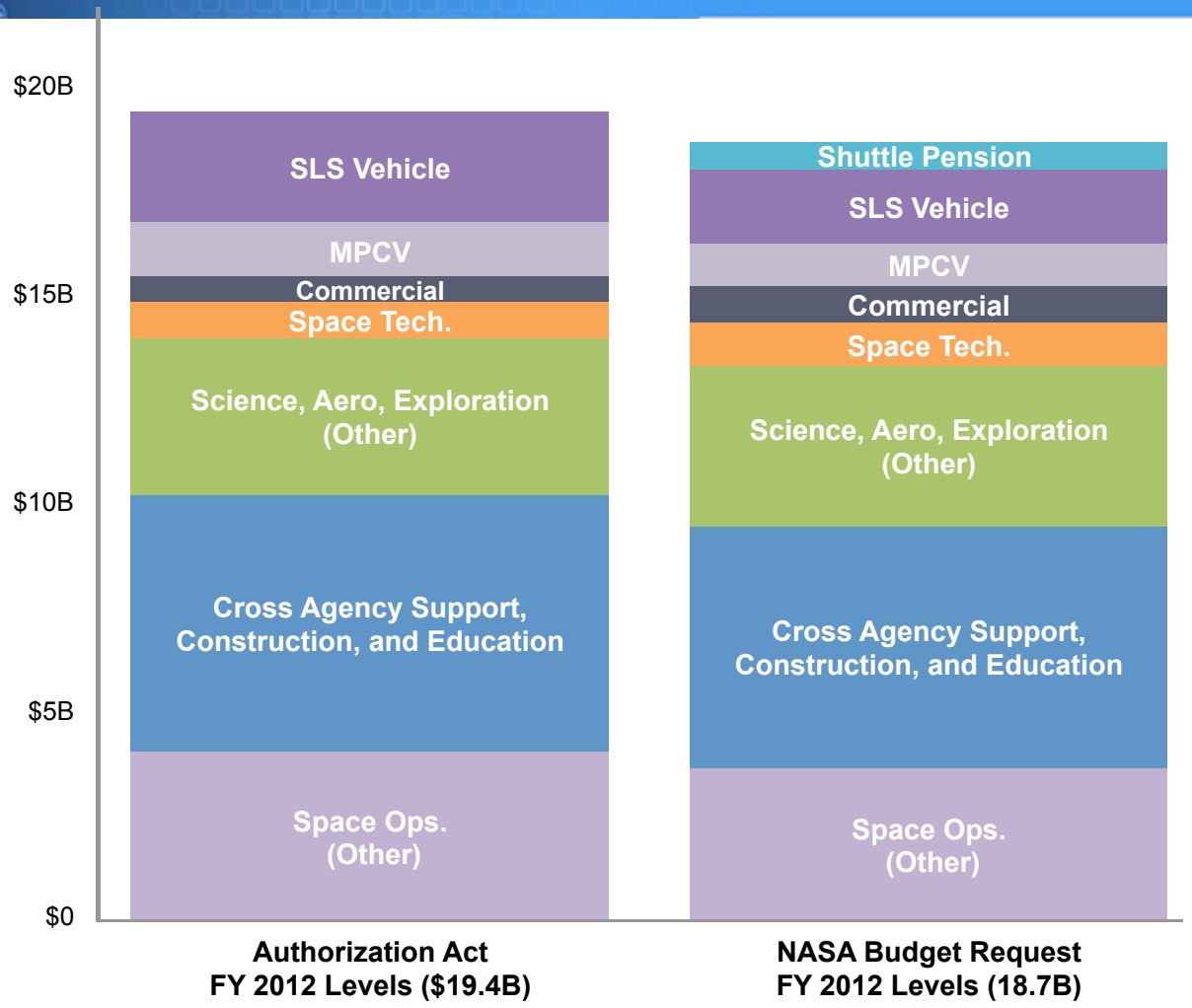


NASA Topline Reduction Impacts

NASA's overall budget request is flat, while the Authorization Act anticipated an annual budget increase of over $1.2 billion by 2013



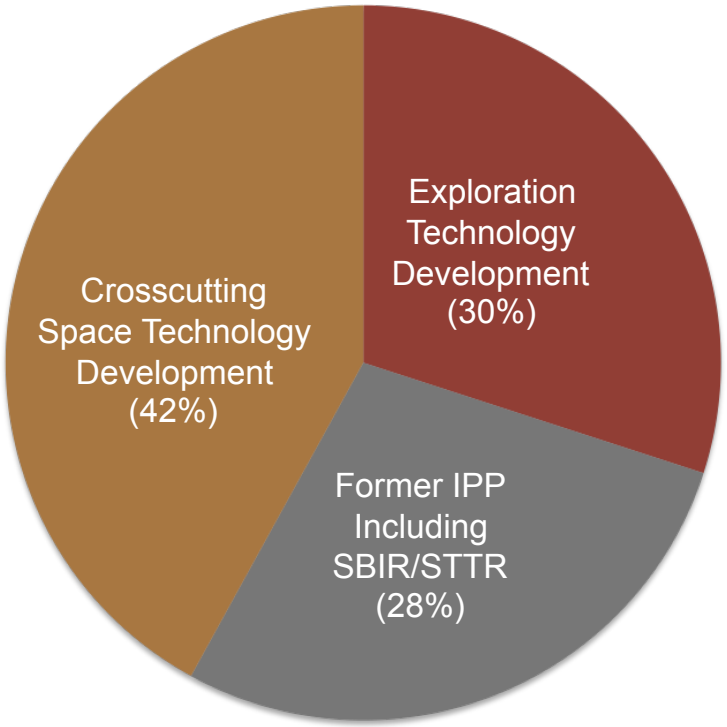
Budget Challenges



NASA's budget request for major programs is aligned with authorized levels, however has been affected by an overall topline reduction and an unexpected Shuttle workforce pension payment

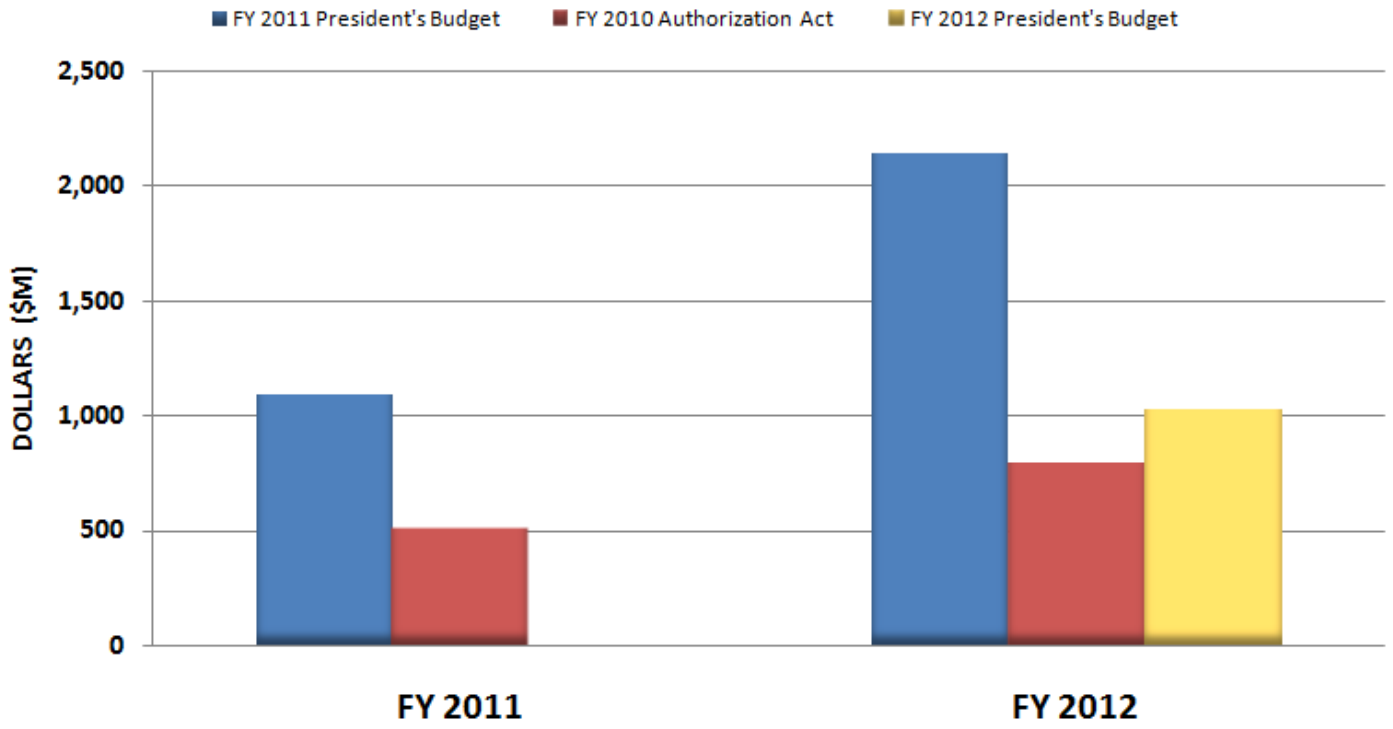
Proposed FY 2012 Space Technology Budget

- In FY 2012, Space Technology is proposed at approx. 5% of the President's $18.7B request for NASA.
- The $1024M for Space Technology in FY 2012 includes:
  - The SBIR/STTR program and related technology transfer and commercialization activities ($284 million) funded in FY 2010 through NASA's Innovative Partnership Program
  - Movement of a majority of the Exploration Technology Development and Demonstration activities ($310 million) from the Exploration Systems Mission Directorate
  - The Crosscutting technology development activities ($430 million) proposed as part of the President's FY 2011 request.
- All of the Space Technology programs have been carefully formulated over the past year, and have deep roots in technology development approaches NASA has pursued in previous years.
- The FY 2012 request for Space Technology provides a modest increase above the level projected in the NASA Authorization Act of 2010, consistent with the Administration's priority on federal investments in research, technology and innovation across the Nation.
  - The FY2012 request for Space Technology compares with approximately $800 million projected for these same activities in 2012 in the NASA Authorization Act of 2010.



NASA FY2012 Proposed Space Technology Budget ($1024M)

Space Technology Budget Trend



		FY 2011	FY 2012
FY 2011 President's Budget	ST	572	1012
	ETD	525	1135
Authorization Act of 2010	ST	350	486
	ETD	162	310
FY 2012 President's Budget	ST		714
	ETD		310

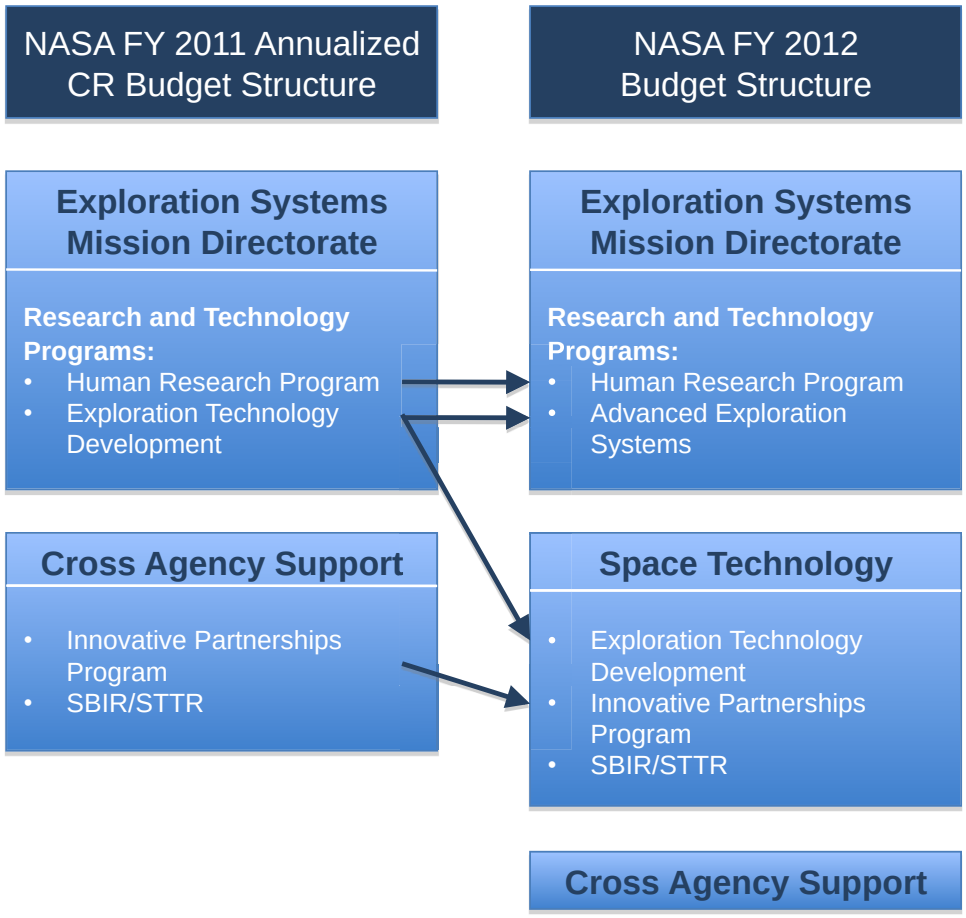
*ST includes PI&ES/SI + SBIR/STTR + CSTD

*ETD includes activities transfered from ESMD to Space Technology beginning in FY 12

** FY12 request for Space Technology is consistent with Authorization Act of 2010 and the Administration's priorities on federal investments in research, technology and innovation across the Nation*

Exploration Technology Development Move Into Space Technology

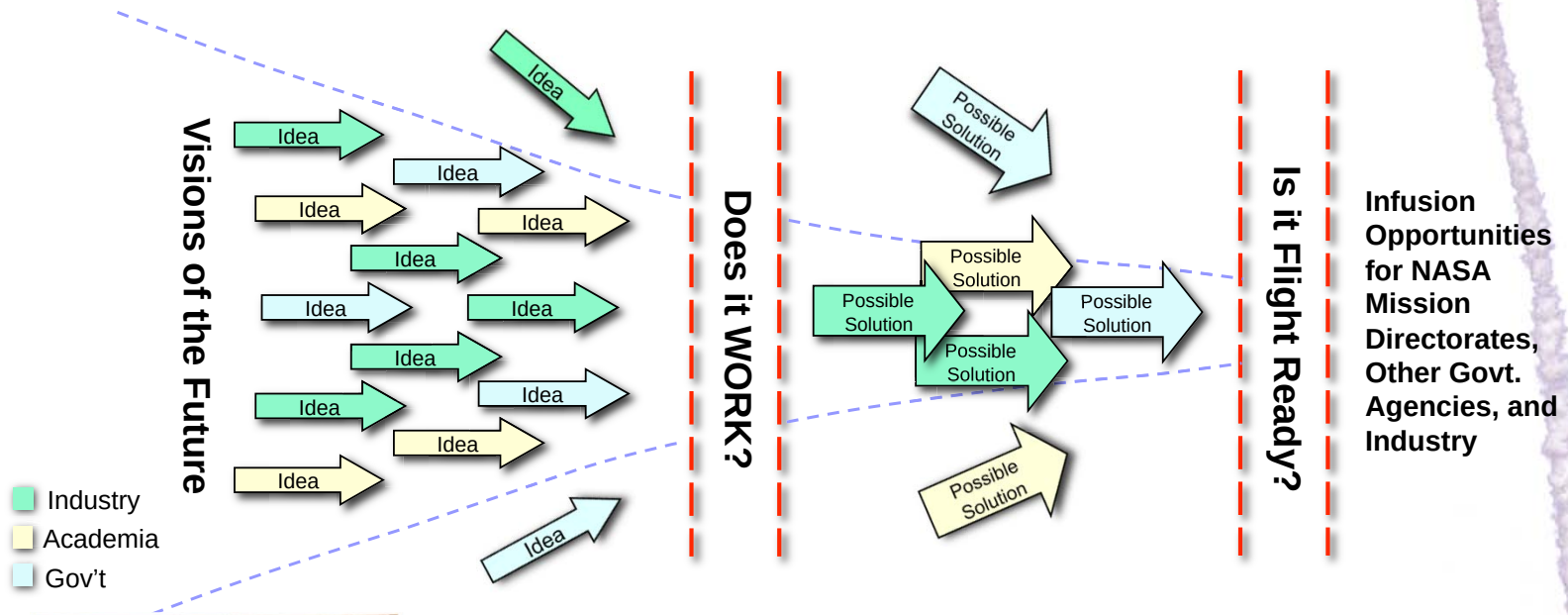
- In FY 2012, a significant portion of the FY 2010 Exploration Technology Development Program as well as the exploration technology activities in planning for FY 2011 will move from ESMD to Space Technology.
- These efforts focus on developing the long-range, Exploration-specific technologies to enable NASA's deep space human exploration future.
- Integrating Exploration technology activities with Space Technology consolidates the management of NASA's space technology programs within an organization focused on technology development and mission infusion and eliminates the potential for overlap had NASA's space technology investments been split among two accounts.
- OCT will manage the Exploration Technology Development (ETD) within its existing divisions and programs: Game Changing Development (GCD) and Technology Demonstration Missions (TDM)
- OCT will work with ESMD in FY 2011 to complete this transition by the start of FY 2012. In FY12, ESMD will provide prioritized requirements and will remain the primary customer for ETD products.
- Additional guidance issued in March.



Space Technology: A Different Approach

- **Strategic Guidance**
  - NASA Strategic Plan
  - Grand challenges
  - Technology roadmaps
- **Full spectrum of technology programs that provide an infusion path to advance innovative ideas from concept to flight**
- **Technical peer-review and competitive selection**
  - Engaging and building an open community of innovators for the Nation
- **Projectized approach to technology development**
  - Defined start and end dates
  - Project Managers with full authority and responsibility
  - Project focus in selected set of strategically defined capability areas
- **Overarching goal is to reposition NASA on the cutting-edge**
  - Technical rigor
  - Pushing the boundaries
  - Take informed risk and when we fail, fail fast and learn in the process
  - Seek disruptive innovation such that with success the future will no longer be a straight line
  - Foster new capabilities, new approaches, and an emerging commercial space industry

Space Technology Development Approach



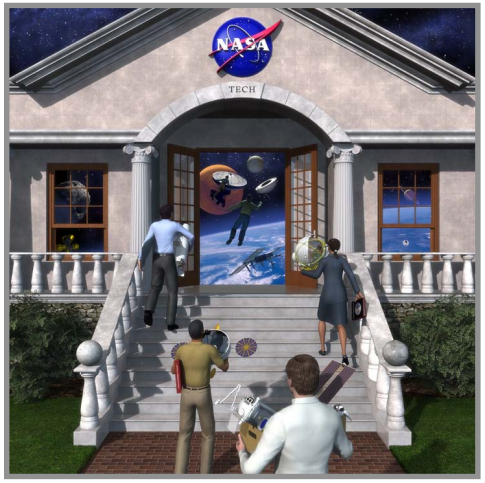
Creative ideas regarding future NASA systems or solutions to national needs.

Prove feasibility of novel, early-stage ideas with potential to revolutionize a future NASA mission and/or fulfill national need.

Mature crosscutting capabilities that advance multiple future space missions to flight readiness status

Early Stage Innovation Division

The Early Stage Innovation Division sponsors a wide range of low TRL efforts for advanced space system concept and initial technology development across academia, industry and at the NASA field Centers.



- **Space Technology Research Grants Program** focuses on innovative research in advanced space technology grants & graduate fellowships for student research in space technology
- **NASA Innovative Advanced Concepts (NIAC) Program** focuses on innovative aeronautics and space system concepts for future NASA missions
- **Center Innovation Fund Program** stimulates aerospace creativity and innovation at the NASA field Centers
- **Centennial Challenges Prize Program** addresses key technology needs with new sources of innovation outside the traditional aerospace community
- **Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR) Program** engages small businesses in our Nation's space enterprise and infuse these products across NASA missions

All Early Stage Innovation selections will be made competitively

Game Changing Technology Division

- The Game Changing Technology Division focuses on maturing advanced space technologies that may lead to entirely new approaches for the Agency's future space missions and solutions to significant national needs.
- Through ground-based testing and/or laboratory experimentation, the Game Changing Technology Division matures technologies in preparation for potential system level flight demonstration.
- Success is not assured with each investment; however, on the whole and over time, dramatic advances in technology, enabling entirely new NASA missions and potential solutions for a variety of society's technological challenges are expected.

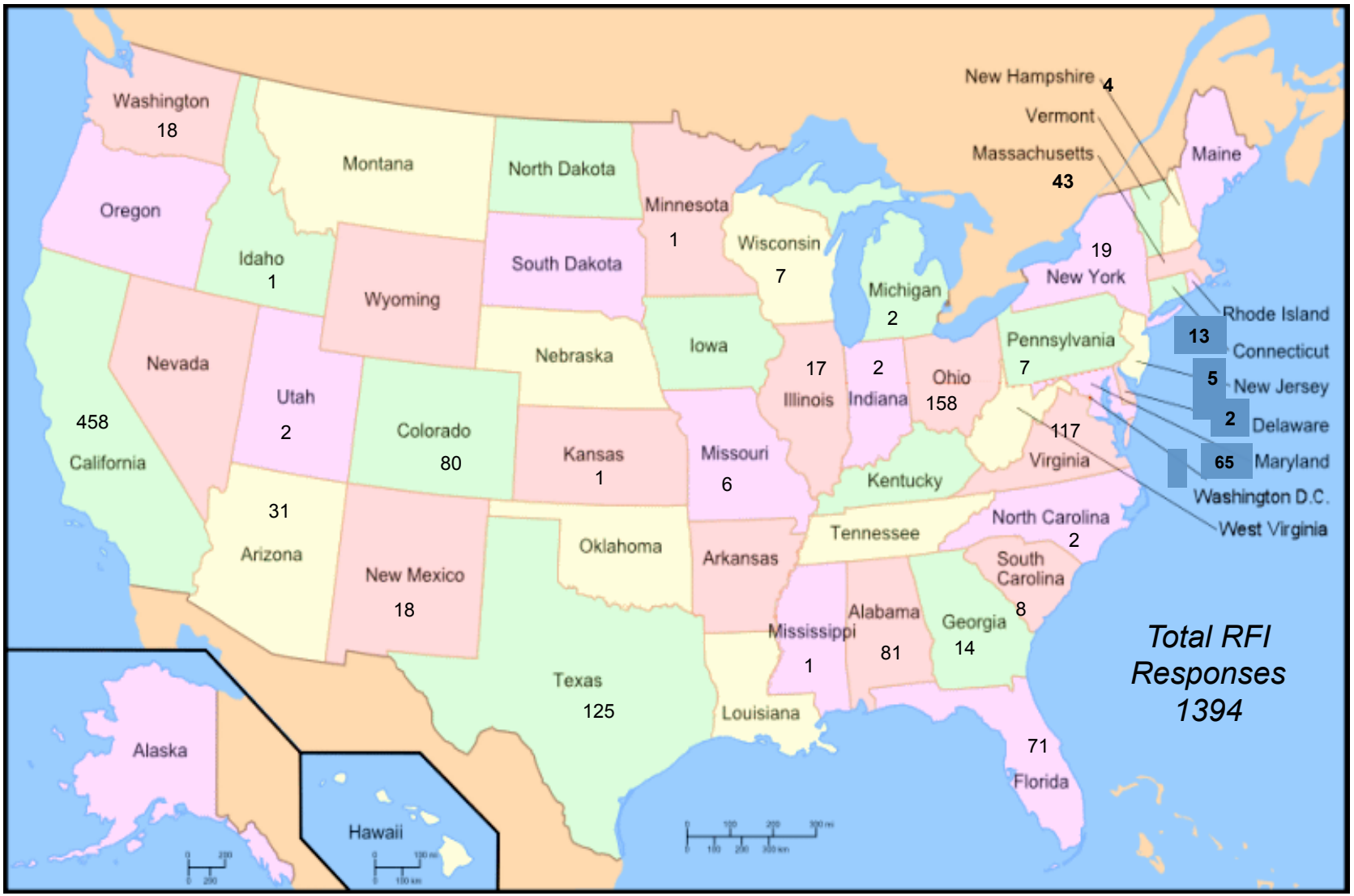
- **Game Changing Development Program** focuses on innovative ideas enabling new capabilities or radically altering our current approaches to space systems
- **Franklin Small Satellite Subsystem Technology Program** enables small satellites to provide game changing capabilities for the space sectors

Crosscutting Capability Demonstrations Division

- The Crosscutting Capability Demonstrations Division focuses on maturation to flight readiness of cross-cutting capabilities that advance multiple future space missions, including flight test projects where in-space demonstration is needed before the capability can transition to direct mission application.
- Matures a small number of technologies that benefit multiple customers to flight readiness status (TRL 7) through Projects that perform relevant environment testing.

- **Edison Small Satellite Demonstration Missions Program** develops and operates a series of NASA-focused small satellite demonstration missions in collaboration with academia and small business
- **Flight Opportunities Program** provides flight opportunities of reduced-gravity environments, brief periods of weightlessness, and high-altitude atmospheric research
- **Technology Demonstration Missions Program** matures, through flight demonstrations, a small number of Agency crosscutting technologies in partnerships with the NASA Mission Directorates, industry, academia and other government agencies

Space Technology RFI Responses by State



NASA Space Technology Roadmaps

NASA Authorization Bill of 2010 (Sept 2010)

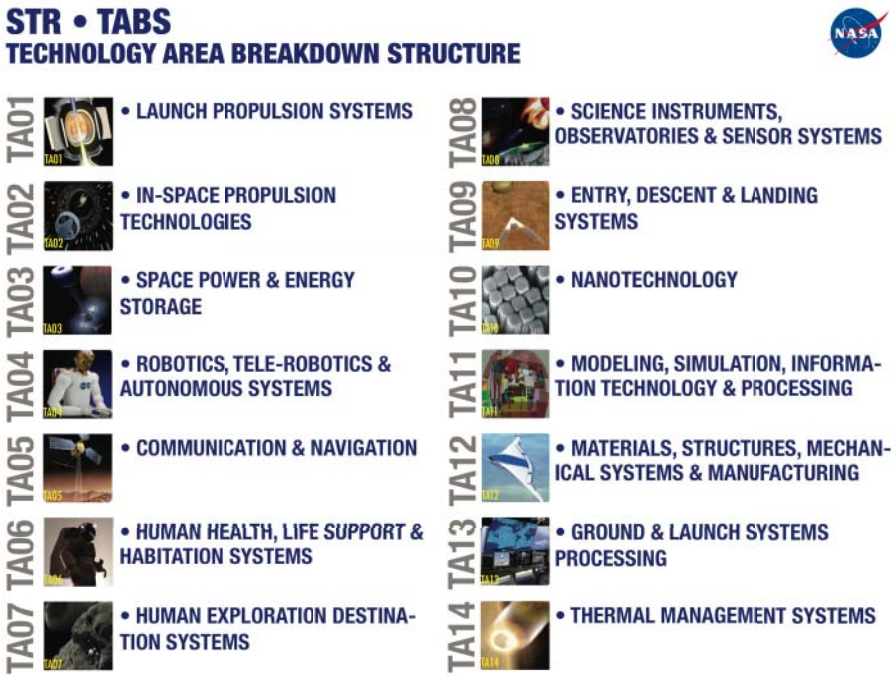
"In the development of the national space technology development policy, the President or the President's designee shall consult widely with academic and industry experts and with other Federal agencies. The Administrator may enter into an arrangement with the National Academy of Sciences to help develop the policy."

In order for NASA to more effectively and efficiently develop space technologies moving forward, it is necessary to establish a sustained set of clearly identified and prioritized technology development goals.

The NASA Space Technology roadmaps, drafted by NASA, and reviewed and vetted for technology investment identification and prioritization by the NRC, will serve NASA as a decadal-like survey, to provide sustained technology investment goals**.**

- *Interim report: Sept 2011*
- *Final Report: Jan 2012*

NASA SPACE TECHNOLOGY ROADMAP
TECHNICAL AREA BREAKDOWN STRUCTURE



More information at http://www.nasa.gov/offices/oct/home/roadmaps/index.html

Space Technology Improves Our Lives Everyday

- NASA has a long history of technology transfer.

- **By investing in Space Technology, NASA will continue to make a positive difference in the world around us**. The benefits of NASA technology impact our Nation's economy, creating new services and industries in the fields of health and medicine, transportation, public safety, consumer goods, environmental resources, energy and computer technology.

- Each year since 1976, *Spinoff* magazine highlights 40-50 of NASA technology transfer successes from the prior year.

- Nearly 1,700 Spinoff stories are also available online in a searchable format at: http://www.sti.nasa.gov/spinoff/database

- National media continues to focus on commercialization benefits of NASA technologies. OCT has initiated a new weekly web series entity entitled "*Space Tech Improving our Lives" at:* http://www.nasa.gov/oct

NASA Space Technology Improving Our Lives

Advanced Diagnostic Ultrasound in Microgravity

LED Light Therapy For Pain Management

Groundwater Remediation

Winglets Save Fuel Cost

Unmanned Aero Vehicles

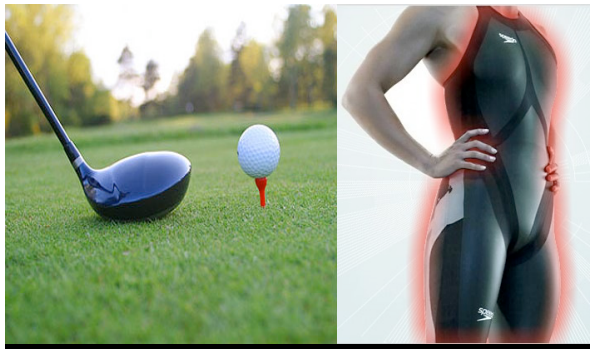
Lithium Batteries for Cars

Aerogel Insulation

Eye Exams

Infrared Thermometers

Memory Foam



Sports and Recreation

Nutritional Supplements

Opportunities

- SBIR/STTR, Flight Opportunities, Center Innovation Fund, Centennial Challenges are ongoing programs, funded in FY 2011 CR based on enacted FY 2010 levels.
- Inaugural Space Technology Graduate Fellowship call closed on February 23. Selections anticipated for start of Fall 2011 semester.
- Initial NIAC, Game Changing Development, Technology Demonstration Missions calls released on March 1. Presently open.
  - NIAC seeks transformative ideas to enable new aeronautics and space systems capabilities.
  - Game Changing Development is soliciting proposals for research and technology development for revolutionary improvements in America's space capabilities.
  - TDM proposals are sought in four areas: high-bandwidth deep space communication, navigation and timing; orbital debris mitigation or removal systems; advanced in-space propulsion systems; and autonomous rendezvous, docking, close proximity operations and formation flying.

    http://www.nasa.gov/offices/oct/home/solicitations.html
- All proposals must align with the Agency's Space Technology Roadmaps and Grand Challenges. Awards are contingent on availability of fiscal year 2011 appropriations.
- OCT is not planning to make awards in Space Technology Research Grants, Franklin Small Satellite Subsystem Technology and Edison Small Satellite Demonstration Missions until FY12.

NASA Space Technology: Part of a Broader National Strategy

- **Space Technology is the central NASA contribution to a revitalized research, technology and innovation agenda for the Nation. These investments will stimulate the economy and build our Nation's global economic competitiveness through the creation of new products and services, new business and industries, and high-quality, sustainable jobs.**
  - A renewed technology emphasis balances NASA's long-standing core competencies of research and technology, spaceflight hardware development, and mission operations.
  - An enhanced technology and innovation focus at NASA responds to the recommendations of multiple external stakeholders.
  - By investing in high payoff, disruptive technology that industry cannot tackle today, Space Technology matures the technology required for NASA's future missions in science and exploration while proving the capabilities and lowering the cost of other government agencies and commercial space activities .
- **Pushing the boundaries of aeroscience and taking informed-risk, Space Technology allows NASA and our Nation will remain at the cutting-edge.**
- **In addition to providing a more vital and productive aerospace future, by investing in Space Technology, NASA will continue to make a difference in our lives everyday.**

President Obama, February 3, 2011, at Penn State: "*Innovation is what this country is all about. Sparking the imagination and creativity of our people, unleashing new discoveries -- that's what America does better than any other country on Earth. That's what we do. We need you to seek breakthroughs and new technologies that we can't even imagine yet.*"